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REMARKS

Claims 1-63 were pending in the present Application. Claims 1-15, 32, 53-58, and 61-62 have been withdrawn as a result of a restriction requirement, leaving Claims 16-31, 33-52, 59, 60 and 63 for consideration upon entry of the present Amendment. Applicants appreciate the indication that Claims 24-25, 41-42, 47-48, and 63 have been deemed allowable. No new matter has been introduced by way of amendment.

Reconsideration and allowance of the claims are respectfully requested in view of the above amendments and the following remarks.

First Claim Rejection Under 35 U.S.C. § 102(b)

Claims 16-18, 30-31 and 33-34 stand rejected under 35 U.S.C. § 102(b), as allegedly anticipated by a 2000 High Temperature Surface Engineering, Proceedings of the International Conference article entitled "The Structure of an Interlayer Used to Improve the Adhesion of Plasma Sprayed Al₂O₃ Coatings on to a Steel Substrate" by Guilemany *et al.* (hereinafter "Guilemany"). Applicants respectfully traverse this rejection.

Independent Claim 16 is directed to a material comprising splats having an average diameter of less than or equal to about 2 micrometers.

To anticipate a claim, a reference must disclose each and every element of the claim. *Lewmar Marine v. Varient Inc.*, 3 U.S.P.Q.2d 1766 (Fed. Cir. 1987).

Applicants assert that Guilemany fails to disclose each and every element of independent Claim 16. Notably absent from Guilemany is any disclosure of splats having an average diameter of less than or equal to about 2 micrometers. In making the rejection, the Examiner has stated, on page 3 of the pending Office Action dated January 27, 2006, that "Guilemany discloses a material comprising splats having an average diameter (width) of less than 2 micrometers and a thickness (height) of less than 800nm (abstract). Guilemany also discloses that all splats are less than 5

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micrometers in diameter (abstract).” However, Applicants respectfully disagree with the Examiner’s interpretation of these numbers in the disclosure of Guilemany.

Guilemany is a study of the structure and composition of an interlayer of 95% Ni-5% Al that is plasma sprayed between a low-alloy steel substrate and a plasma sprayed alumina layer. The Examiner’s attention is respectfully directed to the Results and Discussion section of Guilemany, the relevant portions of which have been reproduced for convenience as shown below.

Within the Ni-Al interlayer, low magnification TEM images reveal a **microstructure consisting of a series of splats**, Fig. 1. These splats are typical of the thermally sprayed coatings, that are believed to be deposited through the build-up of splats quenched from a series of molten droplets. The coating is then the result of the deposition of successive layers, and although not all the powder particles do melt during their flight from the spray gun to the substrate, the solidification processes are the major responsible of the final microstructures which are present in every splat.

High magnification TEM observations of **each individual splat show an ordered structure composed of different crystalline zones confined between thin amorphous-like layers**, Fig. 2. Selected area diffraction pattern (SADP) of these layers confirm their amorphous nature, in showing the typical diffuse rings corresponding to a non crystalline materials.

The **structural sequence of crystalline and non-crystalline layers is repeated from the base of the Ni-Al splats for a number of times**. Smaller columnar crystals (height 0.1 μm , width 25 nm) are usually found close to the amorphous zones. As the distance to the amorphous zone increases, larger columnar crystals are formed (height 1 μm , width 0.5 μm), Fig. 3. SADP of this columnar crystals correspond to a FCC phase, with lattice parameters very close to those of the pure nickel. Eventually, equiaxed crystals may form (mean diameter of 0.5 μm). Inside these crystals, small precipitates are frequently found, Fig. 4. It is interesting to note that, **although these structures are present in every splat**, the proportion of each one may change depending on the distance of the splats from the steel substrate.

(Guilemany, Results and Discussion, pps.276-278, emphasis added)

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As described by Guilemany, the plasma sprayed interlayer includes a series of splats, and within each splat there are crystalline zones and non-crystalline or amorphous zones. This is further evidenced in the Conclusions section of Guilemany, on page 281, the first point of which states "The microstructure of an interlayer of Ni/Al has been described. It contains splats, each one containing amorphous zones confined between crystalline layers. In this layer columnar crystals – of different size – and equiaxed grains can be found." It is these zones, which are within the individual splats, that have the sizes recited by the Examiner in the Office Action. Given that these crystalline and non-crystalline layers repeat "a number of times" within each splat, it would be impossible for the splats of Guilemany to have an average diameter of less than or equal to about 2 micrometers as instantly claimed.

In view of the foregoing, Applicants respectfully request reconsideration and withdrawal of the rejection applied to Claims 16-18, 30-31, and 33-34.

Second Claim Rejection Under 35 U.S.C. § 102(b)

Claims 16, 19-20, 26-27, 29, 30-31 and 33-36 stand rejected under 35 U.S.C. § 102(b), as allegedly anticipated by a 1994 Journal of Thermal Spray Technology article entitled "Measurement and Analysis of Adhesion Strength for Thermally Sprayed Coatings" by Lin *et al* (hereinafter "Lin"). Applicants respectfully traverse this rejection.

Lin is a study of the adhesion strength of thermally sprayed coatings. In the Abstract, Lin states "The minimum microstructure detail would be a single splat (often described as a lamella) which is about 5 μm (approximately 0.0002 in.) in thickness and up to 80 μm (approximately 0.003 in.) in diameter." In making the rejection, the Examiner has asserted that the diameter range disclosed by Lin includes the range as recited in Claim 16. However, Applicants respectfully contend that the range (i.e., up to 80 micrometers) disclosed by Lin does not provide sufficient specificity to constitute an anticipation under the statute. Specifically, other than the range disclosed in the Abstract, which is cited above, the only guidance that is provided regarding the microstructure of a splat throughout Lin is in section "1.2. Rationale for Adhesion

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Measurement". The relevant portions of this section are reproduced for convenience as shown below.

The specific thermal spraying process will influence the microstructure of the coating, and thus it can be inferred that the adhesion strength of the deposit will vary. For example, the HVOF technique produces a very dense microstructure with porosity typically less than 2%, compared to the less than 5% porosity for a flame-sprayed or an atmospheric plasma-sprayed material. Thus, factors affected by the spray parameters, including the size and distribution of porosity, oxide content, residual stresses, and macro- or microcracks, influence the performance of a coating system. A coating system may include several materials (polymers, metals, and/or ceramics) in a heterogeneous layered-type structure or as a composite mixture in which several material phases are dispersed. A substrate that is surface prepared and preheated also plays an important role in coating integrity because it is a platform for the transmission of operational stresses.

(Lin, Page 77, paragraph 2, emphasis added)

MPEP 2101.03 states, in part, "When the prior art discloses a range which touches, overlaps or is within the claimed range, but no specific examples falling within the claimed range are disclosed, a case by case determination must be made as to anticipation. In order to anticipate the claims, the claimed subject matter must be disclosed in the reference with "sufficient specificity to constitute an anticipation under the statute." Based on the above-reproduced disclosure of Lin, Applicants believe that the requisite "sufficient specificity" has not been provided by Lin.

Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejection applied to Claims 16, 19-20, 26-27, 29, 30-31 and 33-36.

Claim Rejection Under 35 U.S.C. § 102(e)

Claims 16-23, 26, 29-31, 33-36 and 59-60 stand rejected under 35 U.S.C. § 102(e), as allegedly anticipated by U.S. Patent Application Publication No. 2003/0108680 to Gell *et al.* (hereinafter "Gell"). Applicants respectfully traverse this rejection.

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Independent Claims 16 and 59 both include, *inter alia*, “splats having an average diameter of less than or equal to about 2 micrometers”. Applicants contend that Gell does not anticipate these claims because Gell fails to disclose at least this feature. Gell is directed to duplex microstructured materials, wherein one state comprises nanostructured features and another state comprises microstructured features. Once again, like Guilemany, these features refer to “grain sizes, precipitates, dispersoids, and the like” (see paragraph [0036] of Gell) and not to the individual splats. There is no discussion within Gell of the splat size, let alone of a splat size as instantly claimed.

Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejection applied to Claims 16-23, 26, 29-31, 33-36 and 59-60.

First Claim Rejections Under 35 U.S.C. § 103(a)

Claims 19-21, 26-31, 33-36 and 59-60 stand rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over Guilemany in view of U.S. Patent No. 5,520,516 to Taylor *et al.* (hereinafter “Taylor”). Applicants respectfully traverse this rejection.

For an obviousness rejection to be proper, the Examiner must meet the burden of establishing a *prima facie* case of obviousness, i.e., that all elements of the invention are disclosed in the prior art; that the prior art relied upon, coupled with knowledge generally available in the art at the time of the invention, contain some suggestion or incentive that would have motivated the skilled artisan to modify a reference or combined references; and that the proposed modification of the prior art had a reasonable expectation of success, determined from the vantage point of the skilled artisan at the time the invention was made. *In re Fine*, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988); *In re Wilson*, 165 U.S.P.Q. 494, 496 (C.C.P.A. 1970); *Amgen v. Chugai Pharmaceuticals Co.*, 927 U.S.P.Q.2d, 1016, 1023 (Fed. Cir. 1996).

Applicants respectfully contend that a *prima facie* case of obviousness has not been established against independent Claims 16 and 59, because all elements of these claims have not been taught or suggested by the cited art. Guilemany is discussed above. Taylor fails to

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compensate for the deficiencies of Guilemany. Taylor is directed to zirconia-based coatings on blades for turbines or compressors. In Column 4, lines 14-18, Taylor defines a splat as “a single molten powder particle impacted upon the surface of a substrate wherein it spreads out to form a thick platelet. Generally these platelets are from 5 to 100 microns in diameter and 1 to 5 microns thick, more generally about 2 microns thick.” Thus, based on this definition, Taylor cannot disclose “splats having an average diameter of less than or equal to about 2 micrometers” as instantly claimed.

Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejection applied to Claims 19-21, 26-31, 33-36 and 59-60.

Second Claim Rejections Under 35 U.S.C. § 103(a)

Claims 37-38, 45-46 and 49-52 stand rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over Lin in view of a 2000 University of Connecticut Doctor of Philosophy dissertation entitled “Failure Modes in Plasma-Sprayed Thermal Barrier Coatings” by Schlichting (hereinafter “Schlichting”). Applicants respectfully traverse this rejection.

Independent Claim 37 is directed to a thermal barrier coating comprising splats having an average diameter of less than or equal to about 2 micrometers; a thickness of greater than about 125 micrometers; vertical cracks; and porosity of about 15 to about 40 volume%, based on the total volume of the material.

Applicants respectfully contend that a *prima facie* case of obviousness has not been established against independent Claim 37 because all elements of this claim have not been taught or suggested by the cited art. Lin’s failure to disclose splats having an average diameter of less than or equal to about 2 micrometers is discussed above. Schlichting fails to compensate for the deficiencies of Lin. Schlichting, on Page 39 states that “On the macro scale the nano-coatings appearance is not much different than that of standard APS coatings. It forms a defect microstructure consisting of splat boundaries, porosity, and microcracks. On the micro scale the splats are seen to consist of some large grains surrounded by nano-grains.” In addition,

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Schlichting states on Page 74 "The grain size was measured to be approximately 1.4 μm for all samples." and further illustrates the grain size in Figure 4.1 on page 95. Once again, as discussed above regarding Guilemany and Gell, grain size is markedly different than splat size or diameter. Each splat comprises multiple grains. Given these grain sizes, the claimed splat diameter of less than or equal to about 2 micrometers could not have been disclosed or suggested by Schlichting. Accordingly, the combination of Lin and Schlichting do not render independent Claim 37, and those claims dependent therefrom, obvious.

Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejection applied to Claims 37-38, 45-46 and 49-52.

Third Claim Rejections Under 35 U.S.C. § 103(a)

Claims 37-40, 43-46 and 49-52 stand rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over Gell in view of Schlichting. Applicants respectfully traverse this rejection.

Gell and Schlichting are both discussed above. Given the failure of each reference to individually disclose or suggest a thermal barrier coating, or any material for that matter, comprising splats having an average diameter of less than or equal to about 2 micrometers, their combination would still fail to disclose or suggest this feature. Thus, the combination of Gell and Schlichting fail to establish a prima facie case of obviousness against independent Claim 37, as well as those claims dependent therefrom.

Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejection applied to Claims 37-40, 43-46 and 49-52.

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It is believed that the foregoing amendments and remarks fully comply with the Office Action and that the claims herein should now be allowable to Applicants. Accordingly, reconsideration and allowance are requested.

If there are any additional charges with respect to this Amendment or otherwise, please charge them to Deposit Account No. 06-1130.

Respectfully submitted,

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